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INFORMATION REPORT INFORMATION REPORT

CENTRAL INTELLIGENCE AGENCY

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S-E-C-R-E-T/NOFORN

COUNTRY East Germany

SUBJECT Experiments on Utilization of Claus Furnace Exhaust Gases

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SOURCE EVALUATIONS ARE DEFINITIVE. APPRAISAL OF CONTENT IS TENTATIVE.

[redacted] experimental installation at VEB Ingenieur Technische Zentralstelle fuer der Chemische Industrie, Roehlen, utilizing the Claus furnace exhaust gases for the production of SO_2 and H_2SO_4 through the ammonium bisulfate process. The report includes a description of the production process, power requirements, auxiliary materials, and products.

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According to the Study of the possibilities of utilizing Claus furnace exhaust gases for the production of SO_2 and H_2SO_4, the "ammonium bisulfate process" is the most favorable method. The ammonium bisulfite process has been employed satisfactorily in the experimental installation.

Description of the production process: the ammonium bisulfite process requires the following of the Claus furnace gas:

a) SO_3-content 0.02 - 0.8% average 0.04%

b) O_2-content 3%. in no case more than 4%

c) H_2S-content, no traces, i.e., not detectable with $CuSO_4$

d) no elemental sulphur

These conditions must be satisfied during the entire operation of the Claus furnace. A continuous control is necessary. The Claus furnace exhaust gases are utilized in a waste-heat boiler for the production of steam at 3.5 atmospheres gauge. The gases then enter an injection cooler at a temperature of 120 degrees centigrade and are cooled there to about 33 degrees centigrade with circulating water containing SO_2. The circulating water is recooled by the reflux water in a spray cooler and then, after separation of the acid condensate, returned to the injection cooler.

The gas leaving the injection cooler then passes to a lead-tubing [coil] cooler in which it is cooled to the required absorption temperature of 29 degrees centigrade by means of water coming from the steam jet cooling unit. The accumulated acid condensate is led to a storage tank. The details of the treatment of the acidic condensate in the industrial project must still be clarified. After it has passed through the lead-tubing cooler, the gas is forced by a blower into the absorber, in which approximately 75 percent of the SO_2 is washed out with ammonium bisulfite bleaching solution. The remaining gases leave the absorber with about 0.4-0.6 percent SO_2 by volume.

The SO_2-enriched leaching solution is forced through the injection heat-exchanger and into the distillation column. In the heat exchanger the solution is preheated by the liquid leach which has been in contact with the steam of the distillation column and is brought to boiling temperature in the distillation column. The leach is produced indirectly by means of steam-heated leach boilers, but can also be done by direct introduction of steam, is necessary. The regenerated leach is led back into the absorber after passing through the heat exchanger, the leach precooler and the leach aftercooler. The expelled gas, which consists chiefly of SO_2 and H_2O-vapor, is cooled to 35 degrees centigrade in a two-stage condenser, whereby the greater part of the water vapor is condensed. The SO_2-saturated condensate is returned to the distillation column. After leaving the condenser, the SO_2 gas still contains slight traces of water vapor, which are removed with concentrated sulfuric acid in a two-stage sulfuric-acid drier. Any droplets of sulfuric acid carried along by the SO_2 gas are removed by a glass wool filter. The pure SO_2 gas is then compressed to 4.5 atmospheres gauge in a cooler-compressor and liquefied in a condenser through cooling with recirculated water. The liquefied SO_2 is collected in a pressurized tank, which must be shielded from sunlight and moisture, and brought to the shipping department.

Power requirements:

1. low-pressure steam, 3.5 atmospheres, 2.7 tons per hour
2. recirculated cooling water including requirement for the steam-jet cooler, 375 cubic meters per hour
3. cold water from the steam-jet cooler, 20 cubic meters per hour
4. electric power, 260 kilowatts

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Auxiliary materials:

NH_3, 11 kilograms per hour, 96 metric tons per year

H_2SO_4 (96%), 38 kilograms per hour, 332 metric tons per year

Products:

SO_2 (liquid), 365 kilograms per hour, 3200 metric tons per year

Leaching solution, 110 kilograms per hour, 960 metric tons per year.

H_2SO_4 (75%), 48.5 kilograms per hour, 425 metric tons per year

Exhaust gas (cold), 6350 normal cubic meters per hour.